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(54) FLAME-RETARDANT RESIN COMPOSITION AND ELECTRIC WIRE OR CABLE MADE BY USING THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a flame-retardant resin composition suitable for a coating layer of an electric wire or cable, capable of controlling the whitening due to CO2, and excellent in mechanical characteristics, flame retardancy and extrusion processability.
SOLUTION: This composition contains the following components (A), (B), and (C) respectively in amounts of 80-99 pts.wt., 20-1 pts.wt., and 50-200 pts.wt. based on 100 pts.wt. total of components A and B: a polyolefin (A) synthesized from ethylene and a 2-10C □ olefin by using a single site catalyst, and having an Mw/Mn of 2 or lower, a density of 0.91g/cm3 or lower, and an MI of 3g/10min or lower; a polyolefin (B) obtained by the graft polymerization of a polyolefin resin with 0.1-3wt.% acid anhydride; and magnesium hydroxide (C) comprising flat particles in irregular shapes, with a mean particle diameter of 2-6□m, and treated with a surface treating material comprising a fatty acid or a phosphoric ester.

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Following (A)80-99 Flame-retardant-resin constituent characterized by including the 50 - 200 weight section to a total of 100 weight sections of the weight section and 20 - 1 weight section. (A) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** It is an acid anhydride to MI<=3g /, and 10min(B) polyolefine system resin 0.1-3 Polyolefine (C) carried out weight % graft polymerization The flat particle ** mean particle diameter of the magnesium-hydroxide ** indeterminate form with which the following conditions are filled as 2 - 6 micrometer** surface treatment material It is use [claim 2] about a fatty acid or phosphoric ester. an inorganic filler (D) -- the sum total with (C) -- 50 - 200 weight ****** -- the flame-retardant-resin constituent according to claim 1 characterized by things.
[Claim 3] following (E)30-99 a total of 100 weight sections of the weight section and 70 - 1 weight section -- receiving -- 1 - 20 weight section and (H)120-200 Flame-retardant-resin constituent characterized by including the weight section.
(E) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** As opposed to MI<=3g /, and 10min (F) ethylene Unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride It is an acid anhydride to the polyolefine (copolymer G) polyolefine system resin copolymerized 10% of the weight or more 0.1-3 Polyolefine (H) carried out weight % graft polymerization The magnesium-hydroxide ** 6 corner-guard-like particle ** maximum grain size which fulfills the following conditions by 5 micrometers or less And mean particle diameter is use [claim 4] about a fatty acid or phosphoric ester as 0.5-2.0 micrometer** surface treatment material. following (I)30-70 The weight section and (J)70-30 A total of 100 of the weight section weight -- the section -- receiving -- (-- K --) -- 50 - 100 -- weight -- the section -- (-- L --) -- two - 15 -- weight -- the section -- containing -- things -- the description -- ** -- carrying out -- flame retardant resin -- a constituent .
(I) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** As opposed to MI<=3g /, and 10min (J) ethylene the polyolefine copolymer (K) which copolymerized unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride 10% of the weight or more -- the flat particle ** mean particle diameter of the magnesium-hydroxide ** indeterminate form with which the following conditions are filled as 2 - 6 micrometer** surface treatment material a fatty acid or phosphoric ester -- use (L) red phosphorus [claim 5] following (M)30-70 The weight section and (N)70-30 A total of 100 of the weight section weight -- the section -- receiving -- (-- O --) -- one - 20 -- weight -- the section -- (-- P --) -- 50 - 100 -- weight -- the section -- (-- Q --) -- two - 15 -- weight -- the section -- containing -- things -- the description -- ** -- carrying out -- flame retardant resin -- a constituent .
(M) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which

compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** The polyolefine copolymer which copolymerized unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride 10% of the weight or more to MI<=3g /, and 10min (N) ethylene, (O) It is an acid anhydride to polyolefine system resin 0.1-3 Polyolefine (P) carried out weight % graft polymerization The magnesium-hydroxide ** 6 corner-guard-like particle ** maximum grain size which fulfills the following conditions by 5 micrometers or less and mean particle diameter -- as 0.5-2.0 micrometer** surface treatment material -- a fatty acid or phosphoric ester -- use (Q) red phosphorus [claim 6] The electric wire and cable characterized by having the enveloping layer of one resin constituent of claims 1-5.

[Claim 7] The electric wire and cable according to claim 6 characterized by an electric wire and a cable containing an optical fiber.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
[0002]
[Description of the Prior Art] Invention of a publication is known by JP,1-108235,A and JP,5-247281,A as a technique relevant to a flame-retardant-resin constituent.
[0003] The former is carrying out 50-500 weight section addition of the metal inorganic hydroxide as a fire retarding material, and the latter uses the admixture of an ethylene ethyl acrylate copolymer and an ethylene-vinyl acetate copolymer for base resin.
[0004]
[Problem(s) to be Solved by the Invention] However, there were the following problems in the above-mentioned technique.
** The inorganic system fire retarding material is added so much, and cause a mechanical strength and a flexible fall. Moreover, when a magnesium hydroxide is used for a fire retarding material, it is CO2 in atmospheric air. A magnesium hydroxide reacts through the moisture in atmospheric air, it becomes a magnesium carbonate, and an ingredient front face becomes white. Although this problem does not arise in an aluminum hydroxide, since it is low compared with a magnesium hydroxide, if decomposition temperature raises working temperature, an ingredient will foam to an aluminum hydroxide.
[0005] ** The copolymer is used, and a mechanical strength becomes weak although fire retardancy becomes higher than the ingredient which used only polyethylene as the base.
[0006] Therefore, the key objective of this invention is CO2. The milkiness to depend can be controlled and it is in offering the flame-retardant-resin constituent excellent in a mechanical property, fire retardancy, and extruding nature, and the electric wire and cable using this constituent.
[0007]
[Means for Solving the Problem] As a result of examining many things in view of the above-mentioned situation, this invention person etc. finds out that the aforementioned purpose can be attained by carrying out specified quantity combination of the magnesium hydroxide which limited particle size, a configuration, etc. to specific polyolefine, and came to complete this invention.
[0008] That is, the first description of this invention flame-retardant-resin constituent is following (A)80-99. A total of 100 of the weight section and 20 - 1 weight section It is in the 50 - 200 weight section being included to the weight section.
(A) Ethylene and alpha olefin of carbon numbers 2-10 A single site catalyst With the polyolefine used and compounded, the following conditions Ratio Mw/Mn <=2** consistency 0.91 g/cm3 of the thing ** weight average molecular weight Mw and number average molecular weight Mn to fill It is an acid anhydride below to ** melt index MI<=3g /, and 10min(B) polyolefine system resin 0.1-3 Weight % graft polymerization Polyolefine carried out (C) The flat particle ** mean particle diameter of the magnesium-hydroxide ** indeterminate form with which the following conditions are filled uses a fatty acid or phosphoric ester as 2 - 6 micrometer** surface treatment material. [0009] here -- an inorganic filler (D) -- the sum total with (C) -- 50 - 200 weight

****** -- things are desirable.
[0010] the second description -- following (E)30-99 A total of 100 of the weight section and 70 - 1 weight section the weight section -- receiving -- 1 - 20 weight section and (H)120-200 It is in the weight section being included.
(E) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** As opposed to MI<=3g /, and 10min (F) ethylene Unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride It is an acid anhydride to the polyolefine (copolymer G) polyolefine system resin copolymerized 10% of the weight or more 0.1-3 Polyolefine (H) carried out weight % graft polymerization The magnesium-hydroxide ** 6 corner-guard-like particle ** maximum grain size which fulfills the following conditions by 5 micrometers or less And mean particle diameter uses a fatty acid or phosphoric ester as 0.5-2.0 micrometer** surface treatment material. [0011] the third description -- following (I)30-70 The weight section and (J)70-30 weight -- the section -- a total -- 100 -- weight -- the section -- receiving -- (-- K --) -- 50 - 100 -- weight -- the section -- (-- L --) -- two - 15 -- weight -- the section -- containing -- things -- it is .
(I) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** As opposed to MI<=3g /, and 10min (J) ethylene the polyolefine copolymer (K) which copolymerized unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride 10% of the weight or more -- the flat particle ** mean particle diameter of the magnesium-hydroxide ** indeterminate form with which the following conditions are filled as 2 - 6 micrometer** surface treatment material It is use (L) red phosphorus about a fatty acid or phosphoric ester. [0012] the fourth description -- following (M) 30-70 The weight section and (N)70-30 weight -- the section -- a total -- 100 -- weight -- the section -- receiving -- (-- O --) -- one - 20 -- weight -- the section -- (-- P --) -- 50 - 100 -- weight -- the section -- (-- Q --) -- two - 15 -- weight -- the section -- containing -- things -- it is .
(M) Thing **Mw/Mn <=2 which fills the following conditions with the polyolefine which compounded ethylene and alpha olefin of carbon numbers 2-10 using the single site catalyst ** Consistency 0.91 g/cm3 Following ** The polyolefine copolymer which copolymerized unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or an acid anhydride 10% of the weight or more to MI<=3g /, and 10min (N) ethylene, (O) It is an acid anhydride to polyolefine system resin 0.1-3 Polyolefine (P) carried out weight % graft polymerization The magnesium-hydroxide ** 6 corner-guard-like particle ** maximum grain size which fulfills the following conditions by 5 micrometers or less And mean particle diameter is use (Q) red phosphorus about a fatty acid or phosphoric ester as 0.5-2.0 micrometer** surface treatment material. [0013] Moreover, the electric wire and cable of this invention are characterized by having either of the above-mentioned flame-retardant-resin constituents as an enveloping layer. for example, a conductor -- in the electric wire equipped with an insulating layer upwards, the sheath prepared on this insulating layer itself or the insulating layer is constituted from an above-mentioned flame-retardant-resin constituent, or constituting this sheath from an above-mentioned flame-retardant-resin constituent is mentioned in the cable which carried out package covering of the cable core of the 3 heart with the sheath. Furthermore, the configuration which equips such an electric wire and a cable with an optical fiber is also included in the range of this invention.
[0014] The reason for limitation of the detail of the main raw materials or conditions in each above-mentioned invention is as follows. polyolefine (A), (E), (I), and (M) -- being related -- the ratio of weight average molecular weight and number average molecular weight -- Mw/Mn Reinforcement will become low if 2 is exceeded. Moreover, if a consistency exceeds 0.91 g/cm3, sufficient reinforcement will not be obtained when a magnesium hydroxide (C), (H), (K), (P), an inorganic filler (D) or red phosphorus (L), and (Q) are added. Furthermore, a melt index (temperature of 190 degrees C and 2160g of loads) is 3g / 10min. If it exceeds, at the time of extruding, an ingredient becomes soft too much and it cannot be processed.
[0015] It is because compatibility will become strong too much and workability will worsen, if

under 1 weight section of the effectiveness of a workability improvement is [having limited the loadings of polyolefine (A) and polyolefine (B)] inadequate and 20 weight sections are exceeded. Moreover, having limited each loadings with polyolefine (E), (I), (M), a polyolefine copolymer (F) and (J), and (N) is a mechanical strength (10MPa) which is needed when an electric-wire configuration is processed under by the lower limit of polyolefine (E), (I), and (M). It is because it is not obtained and is because the ratio of a copolymer will fall and fire retardancy will fall, if a upper limit is exceeded.

[0016] In addition, the single site catalyst used for composition of polyolefine (A), (E), (I), and (M) can use well-known various things. For example, the catalyst constituent (JP,6-306121,A) containing the metal, the metal coordinated complex, and activation cocatalyst of a lanthanoids sequence of three to periodic table 10 group etc. is mentioned.

[0017] As for a polyolefine copolymer (F), (J), and (N), fire retardancy with unsaturated carboxylic acid, unsaturated-carboxylic-acid ester, or the amount of copolymerization of an acid anhydride sufficient at less than 10% is not acquired. Acrylate, vinyl acetate, etc. are mentioned to the concrete matter which carries out copolymerization.

[0018] For the polyolefine (B) which carried out the graft polymerization of the acid anhydrides, such as a maleic anhydride, (G), and (O), the amount of grafts of an acid anhydride is 0.1. If compatibility sufficient by under weight % is not acquired but 3 % of the weight is exceeded conversely, compatibility will be too strong and will cause trouble to a processing side. Moreover, for polyolefine (G) and (O), the loadings are CO2 under in 1 weight section. The surface milkiness by the reaction cannot be controlled. On the contrary, if 20 weight sections are exceeded, compatibility will become strong too much and workability will worsen.

[0019] About a magnesium hydroxide, the thing (C) of an indeterminate form and (K) can grind and obtain a brucite ore, and a 6 corner-guard-like thing (H) and (P) can be industrially compounded with a well-known means, and they can obtain them.

[0020] It condenses in less than 2 micrometers, and in a maldistribution, even if mean particle diameter exceeds 6 micrometers to a lifting and reverse, as for the thing (C) of an indeterminate form, and (K), it serves as a maldistribution. The magnesium hydroxide (C) of this indeterminate form and (K) are SiO2 CaO and CaCO3. It is 1-2 by CaO conversion. It weight % Contains and is Fe 2O3. 0.1-1.0 It is desirable to do weight % content of. Thereby, acid-proof improvement can be aimed at. In addition, acid resistance is inferior if these (C) and (K) are made into the thing of a fixed form.

[0021] Moreover, for a 6 corner-guard-like thing (H) and (P), if a maximum grain size exceeds 5 micrometers, that becomes a destructive origin, it is easy to lead to a fall on the strength, and mean particle diameter is 0.5 micrometers. In the following, it condenses, and about a maldistribution, even if it exceeds 2 micrometers to a lifting and reverse, it becomes a maldistribution. In addition, dispersibility is inferior if these (H) and (P) are made into the thing of an indeterminate form.

[0022] These magnesium hydroxides (C), (H), (K), and (P) need to use what performed surface treatment. As surface-preparation material, phosphoric ester, such as fatty acids, such as a lauric acid, stearin acid, oleic acid, and a BAL MICHIN acid, and triphenyl phosphate, tricresyl phosphate, is mentioned. Especially these surface treatment material is desirable in respect of the dispersibility of a magnesium hydroxide.

[0023] In addition, it is because having limited the loadings of the above-mentioned magnesium hydroxide (C), (H), (K), and (P) does not pass a perpendicular tray combustion test under at the minimum of default value when this constituent is made into the enveloping layer of an electric wire, and is because the mechanical strength (10MPa) required of a wire covering will not be obtained if an upper limit is exceeded.

[0024] As an inorganic filler (D), a calcium carbonate, clay, a calcium silicate, talc, an alumina, a metal powder (fiber), glass powder (fiber), a carbon fiber, etc. are mentioned. What is necessary is just to let the addition of an inorganic filler (D) be the amount of arbitration required in order to maintain a configuration. The effectiveness is 150 in general, although it changes also with the addition of a magnesium hydroxide (C) when it changes with processing sizes. It is satisfactory if it is below the weight section. When adding an inorganic filler (D), it considers as the 50 - 200

weight section in the sum total with a magnesium hydroxide (C).
[0025] As for red phosphorus (L) and (Q), it is desirable to use what was covered with either [at least] the organic compound or the inorganic compound in order to prevent generating of poisonous phosphine gas. For example, what covered with what covered the particle front face of red phosphorus with an epoxy resin, phenol resin, etc., an aluminum hydroxide, zinc, etc., and was further covered with thermosetting resin is mentioned. It is because fire-resistant synergism sufficient in under 2 weight sections is not acquired, but it becomes inadequate [fire retardancy] to have limited the loadings of red phosphorus (L) and (Q), and the effectiveness as a fire-resistant assistant will be reaching the ceiling if 15 weight sections are exceeded.
[0026] Furthermore, optimum dose combination of an antioxidant, a stabilizer, an ultraviolet-rays inhibitor, copper inhibitor, lubricant, the pigment, etc. may be carried out at this invention resin constituent if needed.
[0027]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained. (Example 1 of a trial) After carrying out kneading processing of each compounding agent shown in Table 1 with an opening roll and obtaining a constituent, it evaluated about "CO2 milkiness trial", a "perpendicular tray combustion test", "workability", and "tensile strength." A test result is also collectively shown in Table 1. The approach and valuation basis of each trial are as follows.
[0028] CO2 After processing a milkiness trial constituent into a sheet with a thickness of 1mm, a sheet is hung in a desiccator, a pan is carried out to CO2 gas for 48 hours, and weight change is measured. Weight augend is 0.5. Above weight %, since the white sludge is remarkable, it considers as a defect, and it is 0.5. Under weight % presupposed that it is good.
[0029] perpendicular -- tray combustion test cross-sectional-area 22mm2 a conductor -- a top -- 1.2mm in thickness an insulating layer -- polyethylene -- forming -- this insulating-layer top -- as a sheath -- a constituent -- 1.5mm The cable which carried out extrusion covering by thickness is produced. He is IEEE383 to this cable. The perpendicular tray trial specified was carried out. Based on the experimental criterion, what burned to upper limit considered the rejection and the thing which was not carried out as success.
[0030] a workability constituent -- cross-section 2mm2 a conductor -- a part for 50m/from which extrusion covering is turned up and extrusion linear velocity serves as a standard of productivity -- the above -- even if -- the appearance made the good thing good and what a poor appearance, such as melt fracture, produced was made into the defect.
[0031] A tensile strength constituent is processed into a sheet with a thickness of 1mm, and tensile strength is measured. 10MPa(s) which are American Wire Gauge The above thing was considered as success and the thing below it was made into the rejection.
[0032]
[Table 1]

		実施例		比較例					
		11	12	11	12	13	14	15	16
ポリオレフィン (A)	*1	90	90	100	75		90	90	90
ポリオレフィン(A')	*2					90			
無水マレイン酸変性ポリマー(B)	*3	10	10		25	10	10	10	10
水酸化マグネシウム(C1)	*4	90		90	90	90		45	210
水酸化マグネシウム(C2)	*5		130						
水酸化マグネシウム(C')	*6						90		
無機充填剤(D1)	*7	100		100	100	100	100	150	
無機充填剤(D2)	*8		30						
カーボン		5	5	5	5	5	5	5	5
老化防止剤		1	1	1	1	1	1	1	1
Co_2白化試験		良好	良好	良好	良好	良好	不良	良好	良好
垂直トレイ燃焼試験		合格	合格	合格	合格	合格	合格	不合格	合格
加工性		良好	良好	不良	不良	良好	良好	良好	良好
引張強度 (MPa)		12	11	11	14	8	13	11	9

*1 C8のαオレフィン使用、密度 0.902g/cm^3、Mw/Mn≦2、MI＝1g/10min

*2 マルチサイト触媒で合成したポリオレフィン、密度 0.91 g/cm^3、Mw/Mn≦3、MI＝1g/10min

*3 無水マレイン酸をグラフトした直鎖状低密度ポリエチレン(LLDPE)
グラフト量 1.0 重量%、密度＝0.92 g/cm^3、MI＝0.3g/10min

*4 水酸化マグネシウム、平均粒径 5 μm、ステアリン酸で処理
SiO_2CaO,$CaCO_3$ を CaO 換算で 1 重量%、Fe_2O_3 を 0.5 重量%含有

*5 水酸化マグネシウム、平均粒径 5 μm、リン酸エステルで処理
SiO_2CaO,$CaCO_3$ を CaO 換算で 1 重量%、Fe_2O_3 を 0.5 重量%含有

*6 水酸化マグネシウム、六角板状粒子、平均粒径 1 μm、ステアリン酸で処理

*7 無機充填剤（重質炭酸カルシウム）

*8 無機充填剤（未焼成クレー）

[0033] As shown in Table 1, examples 11 and 12 were success at any trial. On the other hand, the example 12 of a comparison of under 80 weight sections had the inadequate loadings of the example 11 of a comparison which does not contain a maleic-anhydride denaturation polymer, and Polyolefine A in respect of workability. Moreover, the example 13 of a comparison using the polyolefine compounded with the multi-site catalyst and the example 16 of a comparison with many loadings of a magnesium hydroxide were rejections in respect of tensile strength. And the example 14 of a comparison with the small mean particle diameter of a magnesium hydroxide is CO2. It was a milkiness trial and few examples 15 of a comparison of a magnesium hydroxide were rejections in the perpendicular tray combustion test.

[0034] Since the mechanical strength is superior to the conventional polyolefine, polyolefine (A) can add more flame retarders, and even if it does not use the red phosphorus which is a fire-resistant assistant, it can acquire high fire retardancy. Moreover, they are polyolefine (A) and a magnesium hydroxide (C1) by using polyolefine (B) (C2), Or compatibility with an inorganic filler (D) can be raised and the constituent excellent in workability can be obtained. Magnesium hydroxide (C1) (C2), It is CO2 even if it adds in a large quantity by having specified the configuration and particle size. The surface milkiness to depend can be suppressed. Furthermore, by using a noncombustible inorganic filler (D), it can contribute to the configuration maintenance at the time of combustion of a constituent, and a combustion test can be passed.

[0035] (Example 2 of a trial) After carrying out kneading processing of each compounding agent

shown in Table 2 with an opening roll and obtaining a constituent, it evaluated about "CO2 milkiness trial", a "perpendicular tray combustion test", "workability", and "tensile strength." A test result is also collectively shown in Table 2. The approach and valuation basis of each trial are the same as that of the example 1 of a trial.

[0036]

[Table 2]

		実施例		比較例					
		21	22	21	22	23	24	25	26
ポリオレフィン(E)	*1	45	60	50	50	20	50	50	50
エチレンエチルアクリレート共重合体(F1)	*2	55		50	50	80	50	50	50
エチレン酢酸ビニル共重合体(F2)	*3		40						
無水マレイン酸変性ポリマー(G)	*4	10	10		25	10	10	10	10
水酸化マグネシウム(H1)	*5	150		150	150	150	100	210	
水酸化マグネシウム(H2)	*6		120						
水酸化マグネシウム(H3)	*7								150
カーボン		5	5	5	5	5	5	5	5
老化防止剤		1	1	1	1	1	1	1	1
Co_2白化試験		良好	良好	不良	良好	良好	良好	良好	良好
垂直トレイ燃焼試験		合格	合格	合格	合格	合格	不合格	合格	合格
加工性		良好	良好	良好	不良	良好	良好	良好	良好
引張強度 (MPa)		12	14	11	14	9	13	9	8

*1 C8のαオレフィン使用、密度0.902g/cm³、Mw/Mn≦2、MI＝1g/10min

*2 エチレンとアクリレートの共重合体(含有量15重量%、密度0.92g/cm³、MI＝1.0g/10min)

*3 エチレンと酢酸ビニルの共重合体(含有量15重量%、密度0.92g/cm³、MI＝0.8g/10min)

*4 無水マレイン酸をグラフトした直鎖状低密度ポリエチレン(LLDPE) グラフト量1.0重量%、密度0.92g/cm³、MI＝0.3g/10min

*5 水酸化マグネシウム、六角板状粒子、平均粒径0.8μm、ステアリン酸処理

*6 水酸化マグネシウム、六角板状粒子、平均粒径0.8μm、リン酸エステル処理

*7 水酸化マグネシウム、不定形粒子、平均粒径6μm、ステアリン酸処理

[0037] As shown in Table 2, examples 21 and 22 were success at any trial. On the other hand, the example 11 of a comparison which does not contain a maleic-anhydride denaturation polymer (G) is CO2. The example 22 of a comparison with many loadings of this denaturation polymer was workability about the milkiness trial, and few examples 24 of a comparison of a magnesium hydroxide (H1) were insufficient about the perpendicular tray combustion test. Moreover, the reinforcement of the example 23 of a comparison with few loadings of polyolefine (E), the example 25 of a comparison with many magnesium hydroxides (H1), and the example 26 of a comparison using the magnesium hydroxide (H') of an indeterminate form was all insufficient.

[0038] It is polyolefine (F1) by using polyolefine (E) (F2), The lack of on the strength is compensated and it is polyolefine (F1), The fire-resistant lowness of polyolefine (E) is covered. (F2) moreover, the thing for which a denaturation polymer (G) is used -- polyolefine (E) and (F1) (F2) (H2) (H2) Magnesium hydroxide (H1), compatibility -- raising -- magnesium hydroxide (H1), CO2 in atmospheric air The phenomenon which reacts and carries out surface milkiness through moisture can be controlled. Furthermore, the constituent of mechanical strength sufficient by using the magnesium hydroxide (H1) of the shape of 6 corner guards and a uniform configuration

and (H2) can be obtained.

[0039] (Example 3 of a trial) After carrying out kneading processing of each compounding agent shown in Table 3 with an opening roll and obtaining a constituent, it evaluated about "CO2 milkiness trial", a "perpendicular tray combustion test", and "tensile strength." A test result is also collectively shown in Table 3. The approach and valuation basis of each trial are the same as that of the example 1 of a trial.

[0040]

[Table 3]

		実施例		比較例					
		31	32	31	32	33	34	35	36
ポリオレフィン(I)	*1	45	60	20	90	50	50	50	50
エチレンエチルアクリレート共重合体(J1)	*2	55		80	10	50	50	50	50
エチレン酢酸ビニル共重合体(J2)	*3		40						
水酸化マグネシウム(K1)	*4	70		70	70	70	45	110	
水酸化マグネシウム(K2)	*5		70						
水酸化マグネシウム(K')	*6								70
赤リン(L)	*7	10	10	10	10	1	10	10	10
カーボン		5	5	5	5	5	5	5	5
老化防止剤		1	1	1	1	1	1	1	1
CO_2白化試験		良好	良好	良好	良好	良好	良好	良好	不良
垂直トレイ燃焼試験		合格	合格	合格	不合格	不合格	不合格	合格	合格
引張強度 (MPa)		14	15	9	18	13	17	8	16

*1 ポリオレフィン、C8 のαオレフィン使用、密度 0.902g/cm^3、Mw/Mn≦2、MI＝1g/10min

*2 エチレンとアクリレートの共重合体(含有量 15 重量%、密度 0.92g/cm^3、MI＝1.0g/10min)

*3 エチレンと酢酸ビニルの共重合体(含有量 15 重量%、密度 0.92g/cm^3 MI＝0.8g/10min)

*4 水酸化マグネシウム、平均粒径 5 μm、ステアリン酸で処理 SiO_2,CaO,$CaCO_3$ を CaO 換算で 1 重量%、Fe_2O_3 を 0.5 重量%含有

*5 水酸化マグネシウム、平均粒径 5 μm、リン酸エステルで処理 SiO_2,CaO,$CaCO_3$ を CaO 換算で 1 重量%、Fe_2O_3 を 0.5 重量%含有

*6 水酸化マグネシウム、六角板状粒子、平均粒径 1 μm、ステアリン酸で処理

*7 赤リン（赤リン含有量 85 重量%）

[0041] As shown in Table 3, examples 31 and 32 were success at any trial. On the other hand, for few examples 31 of a comparison of polyolefine (I), and the example 35 of a comparison with many magnesium hydroxides (K1), reinforcement is inadequate and the example 36 of a comparison with the small mean particle diameter of a magnesium hydroxide (K') is CO2. It was a rejection at the milkiness trial. Moreover, the example 32 of a comparison with much polyolefine (I), few examples 33 of a comparison of red phosphorus, and few examples 34 of a comparison of a magnesium hydroxide (K1) were rejections at the perpendicular tray combustion test.

[0042] It is polyolefine (J1) by using polyolefine (I) (J2), The lack of on the strength is compensated and it is polyolefine (J1), The fire-resistant lowness of polyolefine (I) is covered. (J2) Moreover, magnesium hydroxide (K1) (K2), It is CO2 even if it adds in a large quantity by having specified the configuration and particle size. The surface milkiness to depend can be suppressed. Furthermore, it is a magnesium hydroxide (K1) by using red phosphorus (L) (K2), Even if it does not use it so much, sufficient fire retardancy can be acquired. Therefore, magnesium hydroxide (K1) (K2), The fall of the mechanical strength accompanying using so much

is not produced.

[0043] (Example 4 of a trial) After carrying out kneading processing of each compounding agent shown in Table 4 with an opening roll and obtaining a constituent, it evaluated about "CO2 milkiness trial", a "perpendicular tray combustion test", "workability", and "tensile strength." A test result is also collectively shown in Table 4. The approach and valuation basis of each trial are the same as that of the example 1 of a trial.

[0044]

[Table 4]

		実施例		比較例							
		41	42	41	42	43	44	45	46	47	48
ポリオレフィン(M)	*1	45	60	50	50	20	90	50	50	50	45
エチレンエチルアクリレート共重合体(N1)	*2	55		50	50	80	10	50	50	50	55
エチレン酢酸ビニル共重合体(N2)	*3		40								
無水マレイン酸変性ポリマー(O)	*4	10	10		25	10	10	10	10	10	10
水酸化マグネシウム(P1)	*5	65		60	60	60	60	60	40	110	
水酸化マグネシウム(P2)	*6		65								
水酸化マグネシウム(P')	*7										65
赤リン(Q)	*8	10	10	10	10	10	10	1	10	10	10
カーボン		5	5	5	5	5	5	5	5	5	5
老化防止剤		1	1	1	1	1	1	1	1	1	1
CO_2白化試験		良好	良好	不良	良好	良好	良好	良好	良好	良好	良好
垂直トレイ燃焼試験		合格	合格	合格	合格	合格	不合格	不合格	不合格	合格	合格
加工性		良好	良好	良好	不良	良好	良好	良好	良好	良好	良好
引張強度 (MPa)		15	16	16	18	9	17	17	20	9	9

*1 C8のαオレフィン使用、密度 0.902g/cm³、Mw/Mn≦2、MI＝1g/10min

*2 エチレンとアクリレートの共重合体（含有量 15 重量%、密度 0.92g/cm³、MI＝1.0g/10min)

*3 エチレンと酢酸ビニルの共重合体（含有量 15 重量%、密度 0.92g/cm³、MI＝0.8g/10min)

*4 無水マレイン酸をグラフトした直鎖状低密度ポリエチレン(LLDPE)
グラフト量 1.0 重量%、密度 0.92g/cm³、MI＝0.3g/10min

*5 水酸化マグネシウム、六角板状粒子、平均粒径 0.8 μm、ステアリン酸処理

*6 水酸化マグネシウム、六角板状粒子、平均粒径 0.8 μm、リン酸エステル処理

*7 水酸化マグネシウム、不定形粒子、平均粒径 6 μm、ステアリン酸処理

*8 赤リン（赤リン含有量 85 重量%）

[0045] As shown in Table 4, examples 41 and 42 were success at any trial. On the other hand, the example 41 of a comparison which does not contain a denaturation polymer (O) is CO2. It was a rejection and the example 42 of a comparison with many these polymers (O) had workability inadequate for the milkiness trial. Moreover, the reinforcement of the example 48 of a comparison of an indeterminate form was [the particle of few examples 43 of a comparison of polyolefine (M), the example 47 of a comparison with many magnesium hydroxides (P1), and a magnesium hydroxide (P')] all insufficient. Furthermore, the example 44 of a comparison with much polyolefine (M), few examples 45 of a comparison of red phosphorus (Q), and few examples 46 of a comparison of a magnesium hydroxide (P1) were all rejections at the perpendicular tray combustion test.

[0046]
[Effect of the Invention] As explained above, this invention flame-retardant-resin constituent does the following effectiveness so.
** CO2 The milkiness to depend can be controlled. They are a magnesium hydroxide and CO2 by raising the configuration of a magnesium hydroxide, and specification of particle size and the compatibility of a magnesium hydroxide and base resin. A reaction is controlled and milkiness is suppressed.
[0047] ** Excel in extruding nature. When this invention constituent is especially used as a cladding material of an electric wire and a cable, it is effective for the improvement in manufacturability of an electric wire and a cable.
[0048] ** Excel in a mechanical strength. 10MPa(s) which are American Wire Gauge Since it has the above tensile strength, it is suitable as a cladding material of an electric wire and a cable.
[0049] ** It has sufficient fire retardancy. It can have the fire retardancy which can pass a perpendicular tray combustion test, and can use in various fields as which fire retardancy is required, such as an electric-wire cable and other electronic parts.
[0050] ** In this invention constituent which does not use red phosphorus, the impact ignition at the time of processing and the danger of the poisonous phosphine generation of gas can be eliminated. Moreover, even if it does not use red phosphorus, high fire retardancy can be acquired.

[Translation done.]